W9132T-05-R-0028

LOGANEnergy Corp.

Fort Hood, Texas
Communications Facility
PEM Demonstration Project
Initial Project Report

Proton Exchange Membrane (PEM) Fuel Cell Demonstration
Of Domestically Produced PEM Fuel Cells in Military Facilities

US Army Corps of Engineers
Engineer Research and Development Center
Construction Engineering Research Laboratory
Broad Agency Announcement CERL-BAA-FY04

Fort Hood, Texas

28 March 2006

Executive Summary

Under terms of its FY'04 DOD PEM Demonstration Contract with ERDC/CERL, LOGANEnergy will install and operate two Plug Power GenCore 5kWe standby fuel cell power plants at the Fort Hood airfield communications center, Remote Service Center (RSC4), for one year. The units will be attached directly to the facility's DC bus to enhance critical power availability. However, the system will also be configured to independently test and evaluate the reliability of the GenCore without diminishing its utility. Fort Hood will not bear any cost burden in the project.
The POC for this project is:

Mr. Robert L Kennedy
Program Manager, Fort Hood DPW
Bldg 4219, 77th & Warehouse Ave.
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Proposal – Proton Exchange Membrane (PEM) Fuel Cell Demonstration of Domestically Produced PEM Fuel Cells in Military Facilities

1.0 Descriptive Title

LOGANEnergy Corp. Small Scale PEM 2004 Demonstration Project at Fort Hood, TX airfield communications facility.

2.0 Name, Address and Related Company Information

LOGANEnergy Corporation

1080 Holcomb Bridge Road
BLDG 100- 175
Roswell, GA 30076
(770) 650- 6388

DUNS 01-562-6211
CAGE Code 09QC3
TIN 58-2292769

LOGANEnergy Corporation is a private Fuel Cell Energy Services company founded in 1994. LOGAN specializes in planning, developing, and maintaining fuel cell projects. In addition, the company works closely with manufacturers to implement their product commercialization strategies. Over the past decade, LOGAN has analyzed hundreds of fuel cell applications. The company has acquired technical skills and expertise by designing, installing and operating over 30 commercial and small-scale fuel cell projects totaling over 7 megawatts of power. These services have been provided to the Department of Defense, fuel cell manufacturers, utilities, and other commercial customers. Presently, LOGAN supports 30 Carbonate, Phosphoric Acid Fuel Cell (PAFC) and PEM fuel cell projects at 21 locations in 12 states, and has agreements to install 15 new projects in the US and the UK over the next 18 months.

3.0 Production Capability of the Manufacturer

Plug Power manufactures a line of PEM fuel cell products at its production facility in Latham, NY. The facility produces three lines of PEM products including the 5kW GenSys5C natural gas unit, the GenSys5P Liquid Propane (LP) Gas unit, and the GenCor 5kW standby power system. The current facility has the capability of manufacturing 10,000 units annually. Plug Power will support this project by providing remote monitoring, telephonic field support, overnight parts supply, and customer support. These services are intended to enhance the reliability and performance of the unit and achieve the highest possible customer satisfaction. Vinny Cassala is the Plug Power point of contact for this project. His phone number is (518) 782-7700 ex 1228, and his email address is vincent_cassala@plugpower.com.

4.0 Principal Investigator(s)

Name	Chris Davis	Keith Spitznagel
Title	Chief Operating Officer	Vice President Market Engagement
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388	860.210.8050
Fax	770.650.7317	770.650.7317
Email	cdavis@loganenergy.com	kspitznagel@loganenergy.com

5.0 Authorized Negotiator(s)

Name	Chris Davis	Keith Spitznagel
Title	Chief Operating Officer	Vice President Market Engagement
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388	860.210.8050
Fax	770.650.7317	770.650.7317
Email	cdavis@loganenergy.com	kspitznagel@loganenergy.com

6.0 Past Relevant Performance Information

a) Contract: PC25 Fuel Cell Service and Maintenance Contract #X1237022

Merck & Company
Ms. Stephanie Chapman
Merck & Company
Bldg 53 Northside
Linden Ave. Gate
Linden, NJ 07036
(732) 594-1686

Four-year PC25 PM Services Maintenance Agreement.
In November 2002 Merck & Company issued a four-year contract to LOGAN to provide fuel cell service, maintenance and operational support for one PC25C fuel cell installed at their Rahway, NJ plant. During the contract period the power plant has operated at 94% availability.

b) Contract: A Partners LLC Commercial Fuel Cell Project Design, Installation and 5-year service and maintenance agreement on 600kW UTC PC25 power block.
Contract # A Partners LLC, 12/31/01

Mr. Ron Allison
A Partner LLC
1171 Fulton Mall
Fresno, CA 93721
(559) 233-3262

c) Several Contracts: At more than 20 locations, installed and maintained more than 30 Plug Power fuel cells including both GenSys and GenCore locations.

Mr. Rich Romer
Plug Power
968 Albany-Shaker Road
Latham, NY 12110
(518) 782-7700 ext. 1984
Richard.Romer@plugpower.com

7.0 Host Facility Information

Fort Hood is the largest active duty armored post in the United States Armed Services, supporting two full armored divisions. Fort Hood rests in the 'hill and lake' country of Central Texas between Killeen and Copperas Cove and is approximately 60 miles north of the capital city of Austin, 50 miles south of Waco, 160 miles south of Dallas, and 150miles north of San Antonio. Fort Hood covers a total of 339-square miles. In addition to the 1st Cavalry Division and 4th Infantry Division (Mechanized), Fort Hood is also residence for: 13th Corps Support Command, Headquarters Command III Corps, 3rd Signal Brigade, 13th Finance Group, 3rd Personnel Group, 89th Military Police Brigade, 504th Military Intelligence Brigade, 3rd Air Support Operations Group, TRADOC Test and Experimentation Command (TEXCOM), 21st Cavalry Brigade (Air Combat), Medical Dept. Activity (MEDDAC), Dental Activity (DENTAC), and various other units and tenant organizations.

Figure 1. Fort Hood, TX – Hood Army Airfield area

8.0 Fuel Cell Site Information

The fuel cell will be located near Building 7008 at Hood Army Airfield. This is a communications facility, Remote Service Center 4 (RSC4). The communications system has battery backup power that is estimated to last 4 hours or less but there is no backup generation on site.

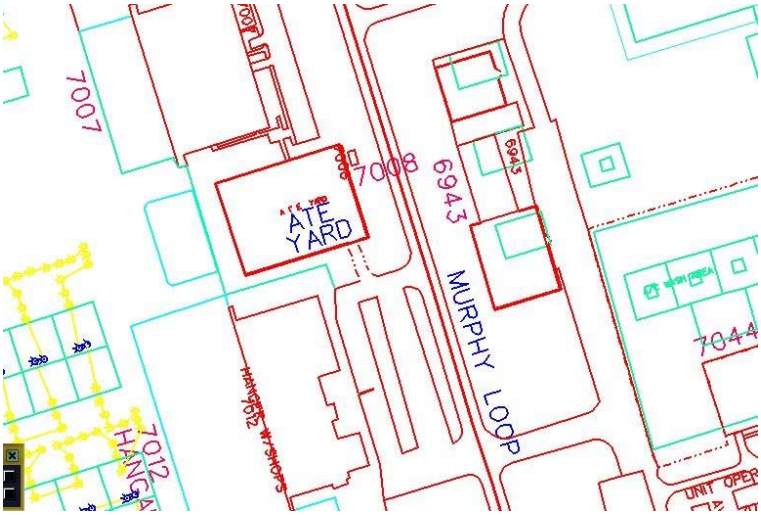


Figure 2. Building 7008 area map

The fuel cell (GenCore) units and the enclosures for fuel bottles (HSM) will be located inside the fenced (ATE) yard. In the photo below, the equipment will be located to the left of the building on the asphalt surface inside the fenced area. Controls (for the CERL required test operations) and termination box will be located on the south facing wall of the building. The GenCore and HSM will be 15 feet from the controls and termination box. Wiring from the GenCore to the termination box will be in rigid metallic conduit mounted on top of the existing asphalt surface.

Figure 3. Building 7008 RSC4

9.0 Electrical System

Grid power to this facility is supplied via underground distribution. Backup power to the critical loads is supplied by a small bank of batteries that will support the loads for a few hours. The batteries supply a -48 volt DC bus.

The Plug Power GenCore 5kW PEM standby fuel cell power plants selected for this project will provide -48 volt DC power to the communications equipment bus located in the facility pictured. When the fuel cell is connected to the DC bus, the existing system will function just as it currently does without the fuel cells. However, as a grid outage continues, the existing backup batteries will begin to deplete; causing the voltage potential to decrease, which will trigger the fuel cells to start. With the fuel cells on-line, the -48 volts on the bus will be maintained (and the batteries charged) so long as the fuel cells continue to operate.

Figure 4. RSC4 Equipment

Figure 4 is a photo of the UPS equipment currently in use at the facility that will be supported by the GenCore. Figure 5 depicts an electrical diagram of the existing system and the additional fuel cell electrical connections.

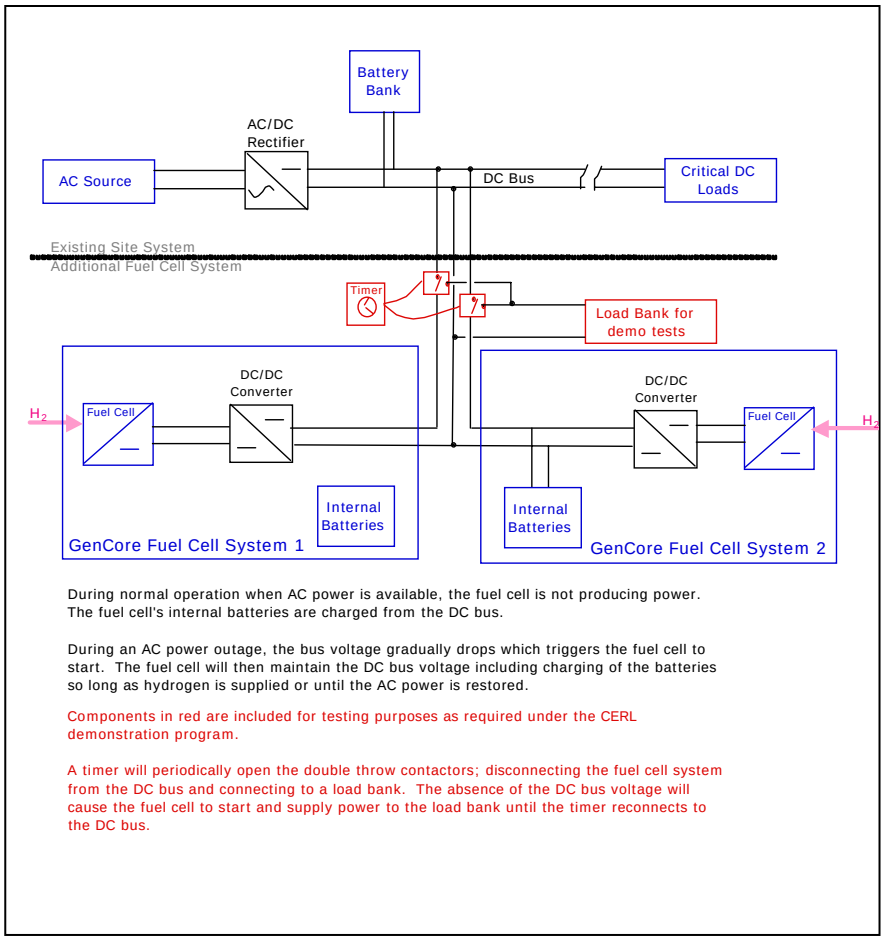


Figure 5. Line diagram of DC connections

10.0 Thermal Recovery System

Thermal recovery will not be a part of this project.

11.0 Data Acquisition System

Per the requirement for CERL demonstrations, data will be collected to determine compliance with the required 90% availability. For a backup power application such as Fort Hood, this means the fuel cells must start for at least 90% of the events when called upon. Since it is unlikely that actual grid outages will be frequent enough to test the fuel cell response, relays will be installed to automatically (and with no disruption to the DC bus) disconnect the fuel cell from the bus and trigger the fuel cell to start off-line from the site DC bus. Controls will prevent testing if an actual grid outage is in progress. Plans for the automated testing call for the fuel cell to start 3 times per day for 6 day per week. For the daily startups, the fuel cell will run 15,10, and 10 minutes. One day per week the fuel cell will run for 60 minutes. LOGAN proposes to install a multi-channel data logger to record the necessary activity and data. For communication with the data acquisition system and the fuel cell, telephone lines will be needed. Separate phone lines are preferred to sharing the existing phone line at the site.

12.0 Economic Analysis

Fort Hood, TX Communications Facility PEM Project

Project Utility Rates						
1) Water (per 1,000 gallons)						
2) Utility (per KWH)Ź						
3) Hydrogen (per bottle)	$ 50.00					
First Cost				**Estimated**	**Actual**	
Plug Power 5 kW GenCore 2 ea.				$ 30,000.00		
Shipping				$ 3,500.00		
Installation electrical				$ 2,480.00		
Communications package				$ 3,140.00		
Testing controll package				$ 2,250.00		
Site Prep, labor materials				$ 450.00		
Technical Supervision/Start-up				$ 1,750.00		
Total				**$ 43,570.00**		
Assume Five Year Simple Payback				$ 8,714.00	$	-
Forcast Operating Expenses	Volume	$/Hr		$/ Yr		
Hydrogen	-	-		$ 5,174.00		
Service				$ 2,000.00		
Total Annual Operating Cost					$	7,174.00
Economic Summary						
Forcast Annual kWH			301			
Annual Cost of Operating Power Plant		$	23.82	kWH		
Project Net Operating Cost		$	23.82	kWH		

13.0 Kickoff Meeting Information

The project kick-off meeting is tentatively scheduled to occur on at 1:00 PM CST April 5th at Fort Hood and by teleconference. At that time CERL, LOGAN and Fort Hood representatives will conference to discuss the purpose, scope, and conduct of the PEM demonstration project. The teleconference will identify any issues to be resolved prior to beginning the installation of the fuel cell.

14.0 Status/Timeline

See Appendix Section 3.

Appendix

1. Fuel Cell Specifications
2. Installation Site Line Diagram
3. Project Schedule and Timeline

Appendix Section 1

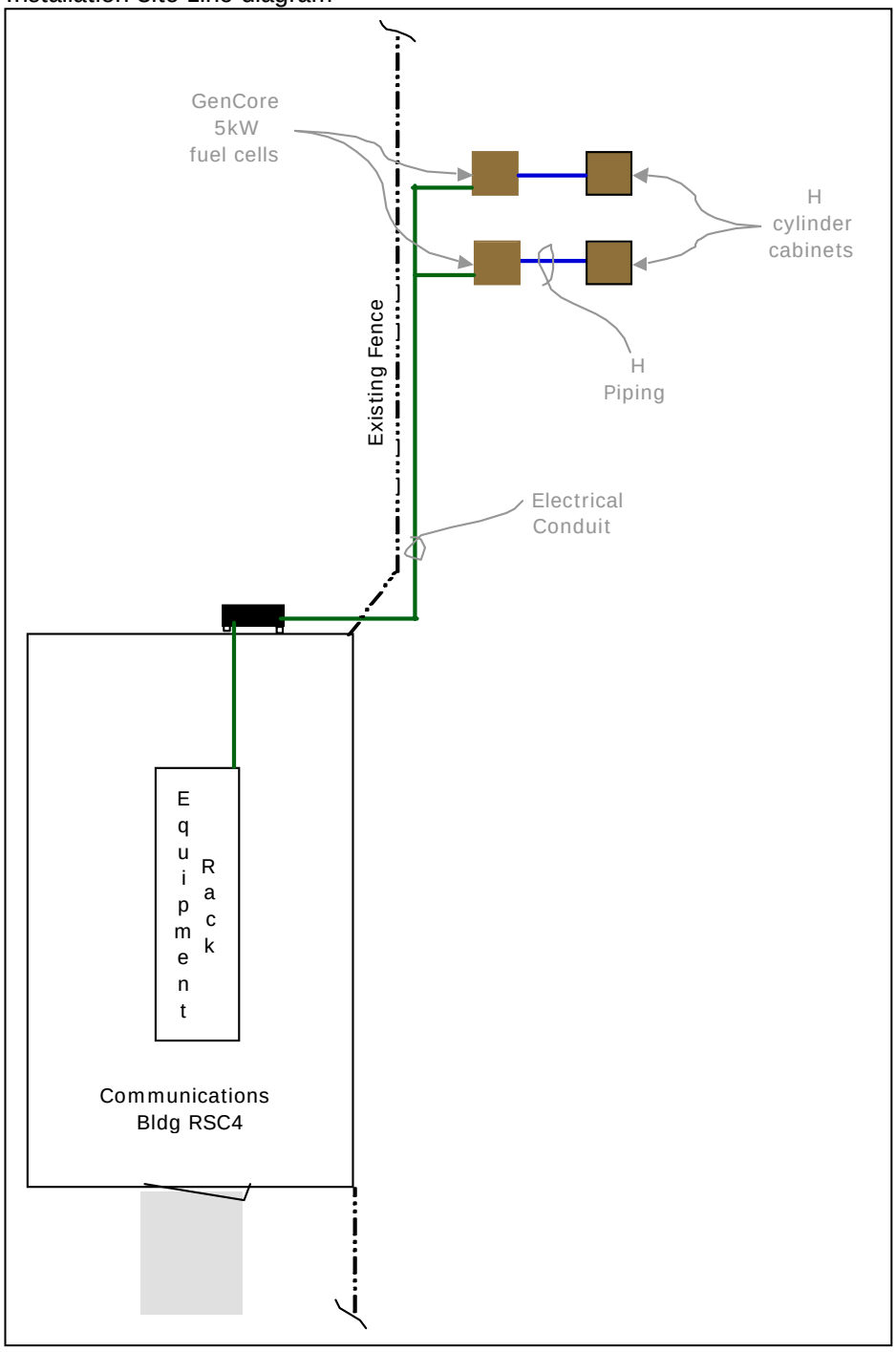
Plug Power GenCore Specifications

PRODUCT CHARACTERISTICS			
Performance	Net Output[1]	0 to 5,000W	✓
	Adjustable Voltage Output	– 46Vdc to –56Vdc	–
		+46Vdc to +56Vdc	✓
	Operating Range – Voltage	– 42Vdc to – 60Vdc	–
		+42Vdc to +60Vdc	✓
	Operating Range – Current	0 to 109 Amps	✓
Fuel	Gaseous Hydrogen	99.95% (dry)	✓
	Supply Pressure	70 +/- 10 psig	✓
	Fuel Consumption	40 slm at 3,000W	✓
		75 slm at 5,000W	✓
Operation	Ambient Temperature	-40C to 46C	✓
	Relative Humidity	0% to 95% non-condensing	✓
	Altitude	-197ft to 6,000ft	✓
Physical	Dimensions	44" x 26"W x 24"D	✓
	Weight	500Lbs	✓
Safety	Compliance	FCC Class A	✓
		ANSI Z21.83	✓
		UL	✓
		Telcordia GR 63, 78,487, 1089	–
Emissions	Water	Maximum 2.0 liters per hour	✓
	Co, CO2, NOx, SOx	<1ppm	✓
	Audible Noise	60dba @ 1m	✓
Sensors	Gas Hazard Sensor		✓
	Pad Shear		○
	Water Intrusion		○
	Tampering		○
Control	Microprocessor w/Diagnostics		✓
	2 LED Alarm Panel		✓
	Communications	RS-232	✓
		Digital Form "C" output	✓
		Modem	○
		Ethernet	○

[1]Rating applies for altitudes up to 1,000ft

Appendix Section 2

Installation Site Line diagram



Appendix Section 3

Project Schedule

Fort Hood, TX Communications Facility

Installation, Monitoring, Performance Evaluations, & Reporting on Two Plug Power PEM Fuel Cells

Column Headings Indicate the Beginning of Each Month

Installation Schedule